2. Cultivated species.

Irrigated cultivation produce cereals (wheat, barley, corn, rice), fodder (Lucerne, clover,), sesame, tobacco, vegetables and fruits. Trees are also grown as windbreakes and to provide provide fuel and construction materials.
In plain and in the mountain on encounter:
- Apricot tree (Zardaloo in Dari), rarely grafted,
- Apple tree (Seb in Dari) seem to produce acceptable fruits grafted or ungrafted.
- Mulberry (Toot in persian), grafted or ungrafted,
- Grape (Angor in Dari), main variety Kishmish, of which the grapes without seeds can be dried.
- Poplar: Populus Alba (Safedar) and Platanus (Panja Chenar in Pushtu and Dari) are planted around fields and along irrigation canals. In the Jaghatu valley a 40 cm poplar sell for 20 000 Afs. (12.02.92: 35 Afs.= 1 Rs. PAK.)
- Willow: Salix sp (Bed in persian), many species.

<u>Certain species are mainly on plain:</u>
- Pear tree: Pirus communis (Nak in pushtu and dari), not grafted. Ceratin varieties have an excellent aspect. Trees with mediocre production cold be grafted (Chardewal, Miray)
- Ailanthus glandulosa, often planted in villages, very resistant to drought.
- Eleagnus sp. (Senjet in Dari and Senzaly , in Pushtu) planted around fields. Resistant to drought and tolerant to salinity.
- Fraxinus sp. often planted in lines in towns, fairly resistant to drought.
- Gleditsia triacanthos, near Band e Sardeh dam. Resistant to drought and produce rejects.
- Robinia pseudocacia, planted in villages and towns, resistant to drought.
- Ulmus sp (Pasha Khana in Dari) planted here and there, fairly resistant to drought.

<u>In mountainous areas:</u>
- Almond: Amygdalus sp (Badam), sweet almond, rarely grafted.
- Walnut: Juglands regia (Aghoz in Pushtu and Charmaghz in Dari), ungrafted, rare in the area (village of Rouhani Baba)
- Plum tree: Prunus domestica, ungrafted with at least two varieties, one with big fruits (Ahloo in Dari) and the other with smaller one (Ahloo Boukhara). Nevertheless, this geographical distribution of species is not due to ecological constraints, It reflects affinitieses and habits of the local population.

Most human activities, like harvest of fuel, animal husbandry and rainfed cultivation, put strong pressure on the environment giving desertification as result by reducing the biological productivity and soil deterioration. The development of irrigated cultivation is to accelerate this phenomena, and challenge the traditional mode of water resource mobilization.

4. RECOMMENDATIONS.

A. Knowledge of environment.

To determinate species best suited for the area one has to deepen the knowledge of different components of the environment

1. Climate:

Research data are available at weather station from Ghazni and Bande Sardeh.
Fitting out some climatic stations including a thermometer (max/min), a rain pluviometer where the NAC is present permanently: Dawlat Khan, Jaghatu, Chardewal, eventually Muhammad Khel and Qala-e-Faqir. Train and motivate an fieldworker to use the instruments and collect data.

2. Soils:

To take a systematic census, and map all zones damaged by salinity.
Establishment of a scale of salinity, if not by electrical resistance or a deep flora study, at least proper cultivation for succeed.
To tackle salinity problems in the area: give priority to rehabilitation of Karize in areas with salinity.
Find the reasons for formation of dunes, and experiment on stabilization of them.

3. Natural Vegetation

- To take samples of the natural flora.
- Make trials on different species to meet the demand for fuelwood.

4. Agricultural Activities and the impact on environment:

- To study rainfed agricultural practices and it`s expansion.
- To search a solution to rust problems of irrigated wheat: Multiplication of resistant variety.

B. Dry Plantation:

The trees or bush plantation in dry area can only be on long term, without very much financial reward.
It does not seem to be valid to be produced as wood for fuel.
The necessity for periodic watering for the first two year and protection for longer period against cattle, rabbits and porcupine represent costly constraint.
It would be difficult therefore to involve the local population.
With the rigorous climate and the bad knowledge we have of it, we

should be careful listing species capable to survive and prosper.

1. Indigenous Species:

- Thuja orientalis: Perfectly adapted to the area, at least on the plains. The growth seem slow, which reduce it`s interest for wood production. One does not know if it can be reproduced easily. Trials could eventually be done (seedling or budding).

- Pistachio (Pistachio atlantica): present a different interest. This species adaptable to many types of soils, is an excellent graft holder for the fruit species P. vera. It is possible to produce grafted plants. For these one shall collect ripe seeds (color blue, greenish) on trees in the Sre Ghar mountain south of Dawlat Khan (maturity from October). These seeds possess a cover that prolong germination. Should be sown in polyethylene bags. Shield grafting should be done in June or September with the help of male graft and female graft as the species is monogamous. The FAO (Quetta) can provide graft wood of excellent variety (maybe needed to keep in cold storage while waiting for the optimal time for grafting.)
Planting should be done in the autumn or springtime when not affected by frost. Plant one male plant for 10 female with 15 m between them. Plantation should be in the steppe (following the ground level or on plots for dry cultivation. It is also possible to sow directly (autumn) followed by grafting on site when it reach the right size. One can also plant pistachio, grafted, in irrigated land or near irrigation canals with prospect of better fruit production.

Crown grafting of adult plants can be done in the "wild" towards the end of winter or beginning of spring in this case fructation is very rapid.

- Eleagnus sp, seem also indigenous. Resistant to salinity, possess thorn (defensive hedges), fruit production, can multiply by budding. It`s resistance to drought is not total but can be kept in dry plantation, on soils slightly humid or near a phreatic sheet, salty or not.
It`s main use is as hedges surrounding irrigated fields.

Fraxinus sp: seem also indigenous. It`s development is more important than Eleagnus but it`s resistance to drought is also not sufficient. It`s use in urban areas seem the best option.

Ulmus sp: same as above.

2. Exotic Species:

To introduce exotic species should be only on trial basis, on small plots with different ecological conditions.

The origin of seedlings species should be carefully noted, specially those cold resistant such as Pinus halepensis, Prosopis juliflora and Ziziphus lotus. For these one should chose seedling from the coldest and driest altitude.
For species already planted in the area one could take seeds from the best performing trees (drought and growth), nevertheless seeds from other origin are acceptable if promising. If one doubt it`s acclimatization one shall try most available varieties adaptable to drought/cold/salinity. For most species multiplication should be attempted by seedlings in polyethylene bags or direct sowing method, if successful. Select the best varieties for multiplication.

Two main localizations:
- Within dry cultivation terrain, mainly for leguminous species which can enrich the soil with nitrogen.
- In steppe zones as implantation for windbrakes in angle to main wind direction. These windbreaker stripes - preferably with different species in depth should be close to irrigation to avoid drought.

It`s role will be also to reduce wind erosion and for this propose can be planted in dry cultivation areas. One should not forget the experimental character of this enterprise.
In any case plantation or direct sowing in pits to allow collection of water.

The following list is not total and not a success guarantier.
- Robinia pseudacacia seem to prosper in the area without more than rain water (after implantation 2 years of watering are necessary for this and other species). This tree produce rejects but drought seem to reduce this ability. Ideal for agroforestry or in lines in towns.
- Ailanthus glandulosa : as above.

The following species can not be found in this area, maybe tried without success (doubtful, but not impossible for some) or not at all:

- Atriplex canescens fodder bush resistant to drought, cold and salinity.
- Cupressus arizonica.
- Gleditschia triacanthos: and it`s 'inermis" form. Trees planted in Bande Sardeh belong to the typical species. some hold clove (not ripe 06/09/92) not very resistant to drought, produce rejects for fodder. "Inermis" is more interresting.
- Juniperus phoenicea
- J. thurifera. The resistance from drought for both species is not assured.
- Pinus halepensis.
- Prosopis juliflora is to be tried on steppe soil and sanddunes. Reproduce easily by direct sowing.

- Rosmarinu officinalis .
- Tamarix articulata, excellent for saline ground and elsewhere. On phreatic sheet close to surface (15-20 m depth) as well as sanddunes. Multiplied by budding on site. Sections of 1 to 2 m length and 5 to 10 cm diameter can be used as cuttings in sanddunes, sticking 10 cm above ground. This species is planted in Afghanistan along the road Torkham - Jalalabad. It can also be found between Khost and Gardez (budwood could be obtained)
- Vitex agnus-castus: Multiply easily by sowing. Some speciment exist in Park road in Peshawar.
- Ziziphus lotus: edible fruits and can be grafted with good varieties.

C. Irrigated plantations.

1. Fuel production

- Poplar, Populus sp.

- Willow: Salix sp.

Both are excellent varieties to produce fuel and construction material (beams), even not having the same quality or use. Tolerance to salinity is to be defined for each variety.
If irrigated cultivation is justified for construction wood, one can question it`s cost outside area were water and soil are plentiful to plants to produce fuel only. The population therefor will use traditional mean unless it`s cost become prohibitive.
One can only hope that natural gas plentiful in Afghanistan underground will be used, at least in towns.

2. Fruit production.

Traditionally there are few grafted trees in the area. This should be widely promoted to constitute a collection of varieties (can ~~be~~ tested and used as rootstock), and nurseries should produce grafted fruit plants to be distributed to farmers.
Species and varieties mentioned below and their graft holder can be obtained from the FAO (Quetta). Anthony Fitzherbert can be contacted in Islamabad. Otherwise indicated, they are excellent for the area (except salty area), in plain or mountain.

- **Apricot:** Both local varieties "Nari" and "Serdi" seem interesting shield grafted on Apricot seedlings.
This species is not widespread in the area, mainly because the fruit does not keep very long after ripening.
An interesting method of drying has been devised by Mercy Corp International) in Quetta (Box 314. Tel: 40 960 - Fax 43019) which organize training for NGO`s fieldworkers. The FAO can be lcontacted for this.
- **Almonds:** Attempts to graft on wild varieties in Jaghatu valley.

were done at Gol Bowri without success by DAI. DAI should be contacted to know more about this. Variety generally are grafted on Bitter Almond or Hybrid Almond peach (G.F. 677) The best are: Ferragnes, Ferraster and Late Karghazi

- **Cherry:** Grafting of excellent varieties such as "Local black" or "Lambert" should be attempted, either in the wild or in nurseries, on the local wild variety (Langa). This variety also grow also on the hills near Jaghatu.
One can hope to produce drought resistant plants. The same could be achieved with Almond.
One can also produce grafted plants on classic graft holder: Prunus Mahaleb or P. Mazzard. One should also take care to plant different varieties together to facilitate fruitful propagation.

- **Mulberry:** If percentage of grafted plants is reduced in the area it should be produced in nurseries. Leaves are excellent fodder.

- **Walnut:** No need to promote a species the population is not used to cultivate, as long as there is no better variety.

- **Pear:** As it is present here and there (Chardewal) with mediocre fruit, it would be interesting to take rooted suckers and graft it with "Williams", "Conference" or "Guyot".
A non grafted tree with good sized fruits, but not ripe, was observed in a garden in Kwigar: one could try the taste of this fruit and possibly take some graftwood.
One can also use FAO graft holders, or quince trees, available in the area of which budding is easy.

- **Apple:** One could use varieties such as "Shin Tulu", "Tur Kulu" and "Amri". At higher altitude "Spartan spur" grafted on MM 106, for which recommended plantation spacing is 5x5m to 6x6m.
For excellent pollination different varieties should be planted together.

- **Plum:** Two preferred varieties,"stanley" and "blue free", with the first having the advantage that it can be dried. Grafted on Bitter almond. Two local varieties can be grafted: "Santa Rosa" and "Herris Monerch" on apricot or Bitter Almond.

- **Vine:** The local population is aware of it`s needs. Not to be grown in nurseries, tolerate some salinity.

Summery of present ecological state
and Agroforestry Potential

in the area of
Gardez and Zormat in Paktia,
Jaghatu and Chardiwal in Ghazni
and Sharan in Paktika Province.

By Henri Chaudet
Consultant
Norwegian Afghanistan Committee
Sept 15, 1992

This report includes a short diagnosis of the environment in the provinces of Paktia, Ghazni, and Paktika in east-central Afghanistan. I has added a few suggestions for future planning in Agroforestry and Horticulture.
The study is based on bibliographical data available on climate, but rely mainy on observations and surveys on site especially about natural and cultivated vegetation.
This was possible thanks to the collaboration of Mr. Saddudin, Zemarai, and Zaher from the Norwegian Afghanistan Committee.

CONTENT

1. DEVELOPMENT OF MISSION.

01/09/92: Trip Peshawar - Kohat - Tall - Khost - Gardez.

02/09 Trip to Dawlat Khan, Zurmat (altitude 2280 m) observation of the natural vegetation, conversation with farmers, visit to irrigated cultivation in Sherbuz south of Dawlat Khan.
Observation of wild plants at Zeray Djelga,

03/09 Visited a valley between Dawlat Khan and Zeray Djelga.
Visiting irrigated cultivation at Dawlat Khan.
Trip to Ghazni and Gulbowri (Jaghatu), At Gulbowri, (altitude 2550-2650 m), observation of natural vegetation and cultivated. Met the NAC nurse from clinic.

04/09 At Golbowri meeting with locals, visit to DAI nursery and irrigated cultivation at Day Isa.
Trip to Ghazni. Visit to plantations. Trip to Chardewal.

05/09 At Chardewal: visit to plantations. Trip to Miray, west of Chardewal. Visit plantations. Visit irrigated cultivation, and meeting with Aqelwal's farmers (altitude 2060 M) south/west of Miray.
Trip to Bande Sardeh
Stop at Seidwall (altitude 2080 M). Bande Sardeh: visit plantations.

06/09 Trip to Zormat. Stop at Tshine: Meet locals.
Stop at Khatye (altitude: 2125 m): visit irrigated cultivation. Stop at Momanned Khel (altitude: 2160m): visit garden. Exchanged views with M. Mahmood Khan, NAC field worker, exchanged views with him. Visit another garden. Stop at Tshaoni (altitude: 2120 m): visit to a garden, meeting with farmer.
Stop at Kote Khil (altitude: 2120 m): exchange of views with 2 farmers.
Stop at Qala-e-Faqir: talk to M. Zabet Abdul Hamid field agent of NAC and more farmers.

07/09 Trip around Zormat:
Stop in Khwaja Gan (altitude: 2180 m, east of Zormat) visit plantation. Stop at Kwizar (altitude 2200 m, north-east of previous village). Stop at Rouhani Baba (altitude 2500 m, south-east of previous village, on hillside): Visit sanctuary and observation of surrounding vegetation. Return some km. west of Khwadja Gan: visit plantation from an old german project. Trip to Sahak Eidari (altitude 2300 m, north-east of Zormat): visit to a garden. Stop at Lewon (altitude 2320 m, north-east of Zormat): visit to fruit orchard. Stop at Gorjey (altitude 2185 m, north-west of Zormat): visit two gardens.

08/09 Stop at Koti Khil (altitude 2150 m, north-east of Kolalgo): visit of ARCON nursery, visit of wheat trials and nursery of IRC. Stop at Kolalgo (altitude 2160 m:) visit another ARCON nursery. Between Kolalgo and Zormat: observation of salination

09/09 At Dawlat Khan talks to farmers, Work with report.

10/09 Return to Peshawar from Dawlat Khan.

2. PRESENTATION OF ENVIRONMENT.

The visited area is within an inverted triangle with the base line from east/west linking Gardez to Jaghatu (25 Km. west of Ghazni) and the point in south would be Sharan (20 Km. south of Bande Sardeh). Mainly consisting of high plain at an altitude above 2000 M, surrounded by mountains.

A. Climate.

1 Bibliographic Data

Data are rare and vague. Weather stations exist at Ghazni and Bande Sardeh but data were not available. Main data given by EarthSat Corporation (Chevy Chase, Maryland Oct. 1990) (1). Unfortunately calculated over too few years (not significant) and transcribed on rough maps, and therefor only approximate.
Chart 1 indicate max. and minimum temperature for each month in the area.

Months.	Jan.	Feb.	March	April	May.	June
T. Max Normal C.	2-8	4-10	10-14	16-20	24-30	32-38
T. Min Normal C.	-6-0	12--8	0-4	4-10	8-16	12-18

Months.	July	Aug.	Sept.	Oct.	Nov.	Dec.
T. Max Normal C.	34-38	32-36	28-32	22-26	12-16	4-10
T. Min Normal C.	16-22	1[illegible]-22	12-18	8-4	-2-4	-8-0

Chart 1: Temperature Max and Min. Gardez, Jaghatu and Sharan area (EarthSat 1990).

Temperature confirm continental climate with max above 30 C. Between June/September (sometime 38 C. in June/July), and data collected for AVICEN map (2) with 3 to 4 months frost in winter.

Months.	Jan	Feb	Mar	Apr	May	June
Monthl. min precip.	40-50	60-70	60-70	30-50	0-10	0-10

Months	July	Aug	Sept.	octo.	Nov.	Dec.
Monthl. min precip.	10-20	0-10	0-10	0-10	10-20	20-30

Chart 2: monthly normal rainfall in Gardez, Jaghatu, and Sharan in mm (EarthSat 1990).

Chart 2 shows that rainfall spread between November and April, with small effect from the monsoon, apart from residual rain in July. May June, August, September and October can be totally dry. The climate has the Mediterranean characteristics of rainfall, which in winter appear as snow.

Fluctuating of precipitation is shown in G.T.Z. report on Gardez Basin (3).

Years	1965	66	67	68	69	70	71	Average
Annual rainfall	488	284	479	364	238	184	196	319

Chart 3.: Annual rainfall at Gardez Between 1965 - 71 G.T.Z

The annual average of 319 mm is based only on 7 years of data. It has only indicative value. The Gardez basin is probably the area of the region with the highest precipitation.

The Gaussen Pluviometric Diagram compare P (precipitation/month in mm) and 2T (average monthly temp. in centigrades. x 2). Above given data on chart 1 & 2 show a 6 months ploviometric deficit (p<ZT) from [illegible] to October. Precipitation occurs mainly in the winter, and the 6 hottest months being dry. The active vegetation period is very short. Conditions for natural vegetation are very rigorous and selective.

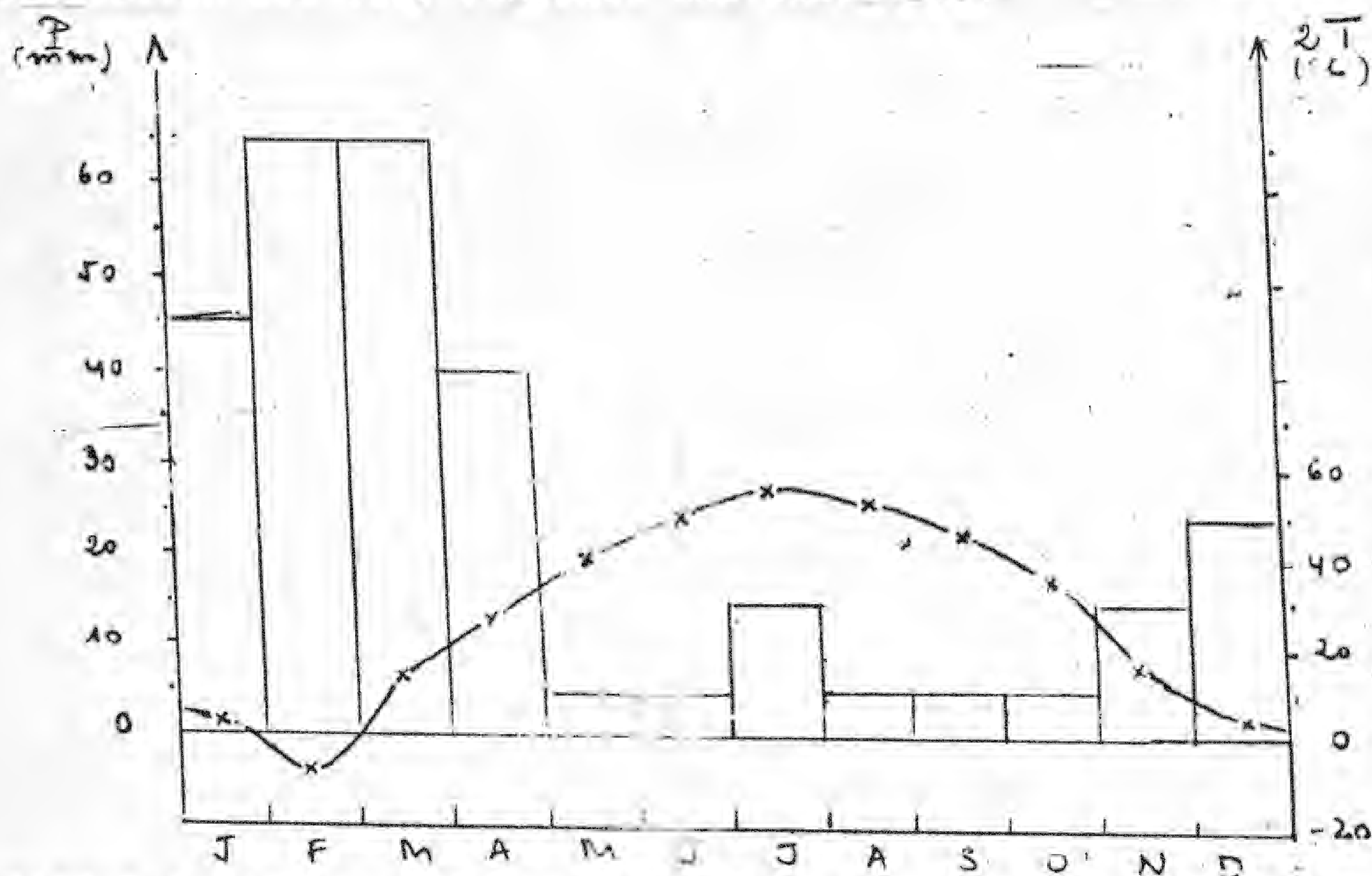


Figure 1. Gaussen Pluviometric Diagram. (EarthSat 1990.)

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(1): Earth Satellite Coorporation: "Afghanistan-Monthly max/min normal temperatures - Monthly precipitation". 1990.
(2): AVICEN: No of months T < 0 deg pr year-map 1:9.000.000 1990.
(3): GTZ: "Principles and recomm. reg. long term planning, Paktia Regional Development Project, Afghanistan"-Vol 2,Part 1.

2. Information collected during the mission.

Data collected from farmers in different localities are as follows:

In the plains frost start between 20th Nov. and 1st of Dec. It ends around 20th March / 1st April

In high areas (Gul Bowri) frost occur between the beginning of Nov. until the end of March (5 months).

Late frost happen in both areas with destruction of fruit tree blooming in high valleys.

Hail occurs between 20th of April and 20th of May. In all sites blooming trees suffer from it.

It snows everywhere between start of Dec. and 20th of March. In higher altitude prolonged until April.

In northern part of region and plain (Dawlat Khan) it rains between 20th of Mach and 20th of May. In lower areas from April.

In south and on the plain the rain cease earlier. Winds blow north - south and west - east. doesn't seem to cause any damages to orchards. They are protected by high walls and fields by popular or Eleagnus trees.

B. Soils.

In the plains agricultural and other soils are of good quality, although rather clayey in the upper levels as in Koti Khile, or deeper in Seidwal and a dozen surrounding villages. A layer of compact clay 0.4 - 1 m thick, 0.5 m - 1 m deep in the soil, is a handicap for fruittree growing. The result is water stagnation which is a damage to all cultivation. Because of the war work on drainage systems has been neglected.

Salination affect a vast area between Kolalgo and Zormat, at the south-west of Chardewal and west of the road from Zormat to Sharan around Aqel Wal (Altitude: 2060 m). South-west of Chardewal farmers listed 33 villages affected, some seriously. Lower zones seems to be most affected, but origin and development of the salination should be studied more thoroughly. This phenomena is getting worse as water resources shrink, and with it the washing of topsoil where plants take roots. Good maintenance of Karizes is necessary for the survival of Agricultural activities.

Salinity have a selective effect on plants. In badly affected areas trees are rare. The Olive tree of Bomenia (Eleagnus sp,

(Senjet in Persian) and the Tamaris (Tamarix sp, Ghaz in Pashtu and Gaz in Dari) survive rather well. Poplar and grapevine tolerate some salinity. Beetroot (Lablaboo in Dari), Onion (Piaz in Pushtu and Dari) and Lucerne (Rishka in Pushtu and Dari) are very resistant to salt. Local tradition to fight salt is every year to apply a 15 cm layer of sand.

One should mention that south of Zormat and west of Muta Khan formation of sand dunes are occurring. According to locals they do not seem to expand by wind. They seem to blow in all directions.

Nevertheless, dune are moving and are they are threatening the vegetation. It can be the result of recent environmental degradation.

In areas with rocks of granite of chist, erosion may be a problem. Fine particles are moved by water. In villages in the hills that were abandoned during the war, terraces are deteriorating rapidly.

C. Natural vegetation.

Determined by the climate it is mainly of steppe type. Some mediterranean floristic elements can be found, like Artemisia, Herba-Alba, Astragalus sp, Centaurea sp, Euphoria sp, Peganum Harmala. Also birds and animals like In Agriculture the climate allows only one harvest.

Natural flora is poor in forest tree species.

On the plains 2 species were observed, the first east-north-east of Zormat between Khwadja Gan and Kwigar (alt: 2200m). One very tall and many centuries old sample of Thuya orientalis (Saberwan in Pashtu) with fruits.
Apparentlt two or three more of these trees are growing in the area. This surviving sample can indicate that this area had a sparse "forest" (with other species) of this type. (Eventual search for isolated samples should be done.)
A second species was found here and there in the southern area. Tamarix sp, a short tree of 2 - 3 m, growing freely or browsed. This plant can be propagated through budding. It can grow naturally even on saline soil.

In mountains a few species were found. Most of them were found around sacred places like shrines.
- Wild almond (Amygoalus sp, Badam in Pashtu and Dari) grows on granitic sides exposed to the north and south of Jaghatu valley between 2500/2700 m altitude. Grow to 3 m hight. Small fruits (1.5 cm). Bitter taste, but some tree produce a sweet variety. DAI is interested in this plant.

- Cotoneaster sp (Khirwani in Pushtu) are found among wild almond.
- A species of the Rosaceae family (Dowlana in Pushtu and Dari) with Edible red berries. 3 to 4 m tall. Prefer damp/humid site.
- Wild cherry, (Prunus sp, Langa in Pushtu) max height 3m. Grows in the same area, bordering fields. Known to grow in mountains nearby (Khogyan). The fruits are sour, one could attempt to use it as a graft holder.
- Juniperus sp (Obachta in Pushtu) old sample 8 m high possess only a few green branches. Seen at Rouhani Baba at 2500 m alt. where it seem to attain it's climatic limit.
- Crataegus sp (Wanza in Pushtu): bush of 1.5 m.
- Wild Cherry pronounce sp. (Gelas in Pushtu): in the mountain near Zeray jerga 2300 m altitude. Busny smaller than mentioned above (1.5 - 2 m) with sweet fruits, eaten by locals seem Od line humid soil.
-Pistacio atlantica (schnee in Pashtu): in the mountain of Sre Ghar south of Dawlat Khan, alt. 2300 m. Mainly on shist in all exposures. It is common in Africa and are adjusted to various soils and are used as rootstock for Pistacia vera (edible pistash).
-Ephedra sp. (Uman in Pushtu) grows near Pistachio vera and Gelas.
-Rosa sp. grows close to previous species and wild almond.

Pistachio, wild almond and wild cherry "Langa" deserve special attention, and trials for multiplication and grafting should be tried.

3. HUMAN ACTIVITIES.

A. Fuel needs.

Fuel is a every day necessity for cooking, and heating in winter. In the past mainly trees and bushes were used, and thereby slowly eliminating existing vegetation. Later dried cows dung mixed with straw has been used, and it removed organic matter from the land. This is the prevailing practice. Wood can be bought but is expensive. Small bushes are collected on steppe for own use or for sale. Close to each house one can see high piles of these dried bushes. This is creating future erosion problems if overdone.

B. Animal husbandry.

The breeding of goat and sheep is not done only by the nomads, but also by the farmers. The former also have camels. The animals are fed during the winter with straw from wheat or barley and plants collected from steppe and mountains. If it is not enough on the other hand nomads can move to better sites.

C. Beekeeping.

Here and there one can find beehives. Some at home in a garden or orchard, others are moved from site to site if they are big. One suppose that any surplus production is for sale.

D. Rainfed agriculture

Rainfed cultivation is an ancient practice and widely used in the area, but must have spread within the last 10 years as mechanization developed. Tractor bought thanks to money brought with emigrates to the gulf takes over from animals.
This type of cultivation s practiced mainly in arid, or semi-arid areas ("Dakhta"in Pushtu or "Dahst" in Dari) in plains and can be seen at altitude from 2100m to 2500m if not higher. The land does not seem to be developed in any special way. Wheat is the main species cultivated in these conditions. The local variety "Lalmi" (means "Non irrigated") with shortstem straw, with a seed resistant to rust which attack irrigated wheat.

In the area of Dawlat Khan (2280m) they sow between the 5th of March and the 20th of April at 17.5 Kgs per hectare. They harvest between the 15th of July and the 30th. It produce on average 2 quintals per hectare (1 Quintal=100 Kgs.). A farmer Mr. Nike Mohammad has cultivated 3,2 hectare in rain fed areas, and 2 ha in irrigated areas in 1992. The extension of surfaces (rain fed) thanks to tractors and the problem of rust for the irrigated wheat make a problem for the steppe. It can cause increased wind erosion, and water erosion in slopes. Land devoted to extensive cattle raising cause a risk of vegetation and soils degradation.

E. Irrigated agriculture.

1 Irrigation:

This form of cultivation is possible only because of the **Kariz system**, underground system of canals. This irrigation make oasis where intensive cultivation is practiced. On the mountains here and there green patches signals settlements allowed by an existing Kariz borrowing a "Thalweg" or a spring. The ancient technic of digging of Kariz demand a considerable human effort. The maintenance is a hazardous job, and is not mechanized. NAC and other NGO's are trying to rehabilitate this systems badly damaged by the war. One can question the future of this technology which is so labour demanding. Digging of wells and pumping of groundwater will reduce underground water reserve,and can also question the future of Karizes.